

Qualitative Geomorphologic Analysis of Thandla Area, Jhabua Region, Madhya Pradesh, India

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Abstract

The article presents an illustrated account of qualitative analysis of geomorphic features observed in Thandla area located in Jhabua Region of Madhya Pradesh in Indian sub-continent. The varied types of morphological features are observed in vicinity of Thandla, Jhabua Region, which include three types of terrain namely (1) Hilly terrain, (2) Undulating country, and (3) Plain country, developed under soil cover by laterite soil, black cotton soil, and alluvial soil. The study area is characterized by plateau, plain, and River valley.

Keywords: Qualitative Geomorphologic Analysis, Thandla Area, Jhabua Region, Madhya Pradesh, India.

Introduction

The study of geomorphological features encountered in a basin or area is termed as the geomorphology, which includes study of development and characteristics features of landscape. In others words, Mackin (1969) remarked that "Geomorphology deals with the origin and evolution of topographic features by physical and chemical processes operating at or near earth's surface. The term originates from Greek words *geo* = earth, *morph* = form, and *logos* = discourse, i.e. the study of earth forms. Geomorphology is based on the principle that all landforms are related to a meticulous geologic process, or set of processes, and landforms thus developed may evolve with time through a sequence of forms dependent in part on the relative time and particular process has been operating." Geomorphological studies are of two types i.e. (1) Qualitative geomorphologic, and (2) Quantitative geomorphologic analysis or study. The presents paper deals with qualitative geomorphologic analysis of Thandla area located in Jhabua Region, Madhya Pradesh in Indian sub-continent.

Characteristics of Study Area

Thandla study area is limited to Latitude $23^{\circ} 0'$ to $23^{\circ} 10' N$ and Longitude $74^{\circ} 30'$ to $74^{\circ} 40' E$, Survey of India Toposheet No. 46 I/12, (Figure 1) in Thandla vicinity of Jhabua Region, Madhya Pradesh, India. Study area cover up 366.58 sq. km, and is approachable throughout the year.

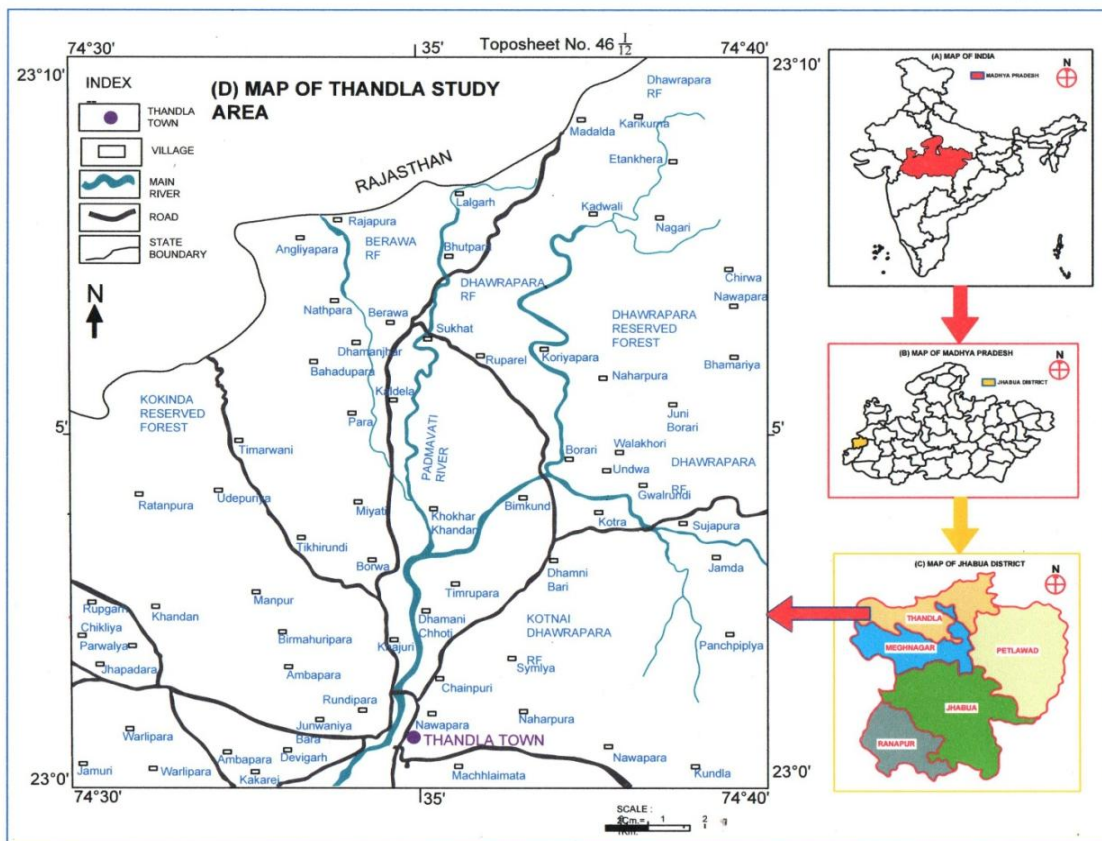


Figure 1: Location Map of Thandla study area, Jhabua district, Madhya Pradesh, India.

Physiographically, Thandla area is characterized by the Hilly Terrain, Undulating country, and Plain country. Climate is changeable tropical - monsoon type (6°C to 46°C). Annual rainfall varies from 423.00 to 2086.20 mm, and generally dry. Relative humidity is 34.4 to 50 %. Geologically, study area is mainly characterized by quartzite, phyllite, basaltic lava flows, which are having joints and fractures with black cotton, lateritic, and alluvial soils. The population of Thandla tehsil area is characterized by human population of 182,362 as per Census, 2011.

Fauna and Flora

Fauna

The fauna is comprised of domestic animals such as horses, cows, sheep's, cats, dogs, hens, goats, snakes and different types of birds such as sparrow, pigeons and ducks; and wild life is meager. The common wild animals include monkeys, rabbits, wolf, foxes and different types of birds namely, owls, cuckoo, raven, bats, nightingales, peacock and other animals include such as reptiles, worms and insects, turtle, crab, body-licer, ant, beetle, lizard, leech, fire - fly, white ant, butterfly, scorpion, fish and drone.

Flora

Flora of Thandla area is rather scanty in spite of having favourable environmental scenario. At a few places, study area is enclosed by thick vegetation. The plants recorded in the area are - amarbel, anar, aawla, banana, banyan tree, babool, carrot, ginger root, jamun, khajur, mahua, mango,

mudar, neem, palas, papita, potato, and sandal wood. Common crops include: groundnut, maize, and wheat.

Geomorphological and Geological Work

Survey of literature reveals that a fairly good number of workers namely, Bose (1884), Fermor (1909), Heron (1936, 1953), Gupta and Mukherjee (1938), Roy Choudhary (1955), Das Gupta (1959), Nayak (1966, 1969), Lahiri (1971), Munshi, Khan and Ghosh (1974), Narayana (1974), Radhakrishnan (1974), Basu (1976), Banerjee and Basu (1979), Kandpal and Sengupta (1988), Sartana (1988), Tiwari *et. al.*, (2003), Khan *et. al.*, (2005), Damor (2008), Chauhan (2008), Bhuriya (2009), Bhuriya (2010, 2014), Katara (2012, 2016, 2019), Ateria, *et. al.* (2015), Katara and Dev (2016 a), Katara and Dev (2016 b), Katara and Dev (2017), and Others have conducted geological investigations in the vicinity of Jhabua district.

Geomorphological Analysis

Geomorphological analysis involves the measurements and mathematical analysis of landforms of earth surface. Computation of hydrologic parameters of drainage basin provide valuable evidence for determination of trends runoff and ground water condition of the basin. Geomorphological parameters are measured by using conventional methods followed by Horton (1932, 1945), Strahler (1957, 1964), Marisawa (1959), Krishnamurthy *et.al.* (1996), and others. Geomorphological analysis has been classified into two parts: (A) Qualitative, and (B) Quantitative Analysis.

Qualitative Analysis

The qualitative analysis deals with understanding of phenomena, that is based on numerical data. The emphasis is placed on an idea or concept. Qualitative analysis involves relationship between cause and effect and relied on mathematical and experimental data - Hills, River Valley, Plain, plateau, and Soil.

Hills

Hill is a noteworthy feature of landform. Hills are characterized by height and slope. Leopold *et. al.* (1964) described that slopes are part of landscape between the crest of hills and their drainage lines. Slopes are interdependent with stream channels and the geometry of drainage basins (Figure 2, 6).

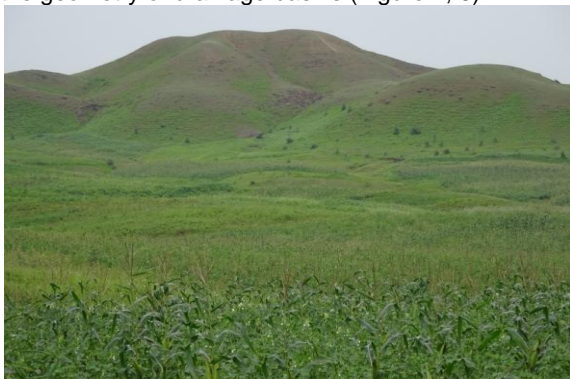


Figure 2: A view of Hill developed near Khokhar Khandan village of Thandla area, Jhabua district, Madhya Pradesh.

River Valley

River forms a terrain, which is known as a valley. The linear erosion can be observed in gorges. The young valley has a V shape, the mature valley is broader, has a valley bottom, and the valley sides are smoother. In downstream parts, the river flows in a broad, flat valley, as a old valley. The rock can influence cross section of the valley. The valley sides are steep in a permeable hard rock terrain. The river pattern is affected by the material and geological structure (Figure 3).



Figure 3: A view of Padmavati River valley in vicinity of Rundipara village, Thandla study area, Jhabua district.

Plain

Plain is formed by action of mechanisms (Figure 4, 6). As the floors of adjoining cockpits

interconnect at their extremities, the level areas join and gradually form a surface (Ahnert, 1998).



Figure 4: A view of plain observed at Thandla town, Jhabua district, M. P.

Plateau

Plateau, is generally recognized as tableland which is also called as high plain. Tableland, is an area of highland generally comprised of relatively flat terrain. A high eroded plateau is called as a dissected plateau. A plateau is a structure which is produced by volcanic activity and it is known as flat-topped mountains. They are found on continents around the world almost in most of the countries. In the study area, the plateau is well developed near Madalda village (Figure 5, 6).



Figure 5: A view of Plateau observed near Madalda village, study area, Jhabua.

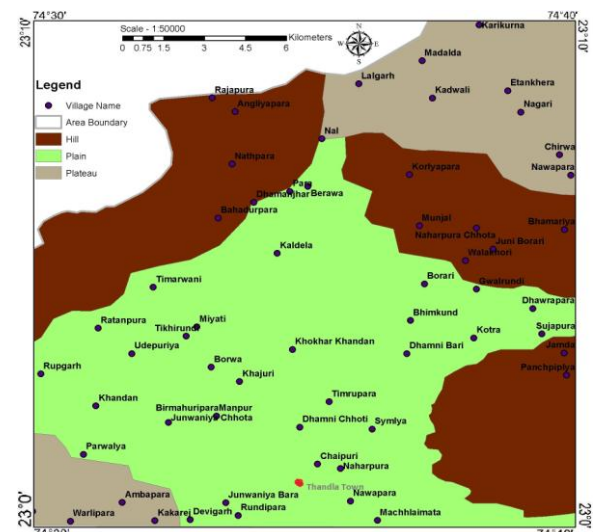


Figure 6: A Map showing the configuration of Hill, Plain, and Plateau in Thandla study area, Jhabua district.

Soil

Soil is a weathered product of rock materials. There is difference of opinion regarding the definition of soil amongst pedologists and geologists. Geomorphologists are concerned with the entire weathered zone-from surface down to unweathered bedrock (Leopold *et. al.*, 1964). Soil is considered as a geological formation of Recent age. The types of soils have been observed in the Thandla study area are- (1) Black cotton soil, (2) Lateritic soil, (3) Red loam and, (4) Alluvial soil.

Black cotton soil

The black cotton soil exhibits black colour and contains clay content, low permeability, high plasticity, moisture and water retaining capacity. This is argillaceous and contains 40 to 60% of clay. It has fine texture and a degree of plasticity becoming sticky. Black cotton soil has been derived from basaltic rocks in the semiarid conditions (Figure 7, 11).



Figure 7: A view of Black cotton soil developed near Khajuri village of Thandla.

Lateritic soil

Lateritic soil covers small area about 14,000 hectares forming about 5 % of the total soil of the area. This type of soil occurs as a thin cop of almost uniform thickness covers the hills formed mainly of quartzites and gneissic ridges (Figure 8, 11).



Figure 8: A view of Lateritic soil developed near Ratanpura village in Thandla area.

Red soil

The red soil is also known as red loam. This is characterized by the coarse texture and is poorly sorted. The clay content is reported to be less than 30 %. The soils are found around Thandla occupying the valleys underlain by the gneiss, quartzites and phyllites. This soil is observed at several places in the study area (Figure 9, 11).



Figure 9: A view of Red soil developed near Bhamariya village in Thandla area.

Alluvial soil

Alluvial soil is seen along the banks of rivers and their tributaries. It is mostly pale yellow to grey in colour (Figure 10, 11).



Figure 10: A view of Alluvial soil developed near Khajuri village in Thandla area.

Alluvial soil is a key group of soils and includes such soils, which have been spread out by streams along banks in catchment area. These are made of fine material and stratified. Due to their heterogeneous composition, fine size and negligible leaching, these soils are very fertile (Singh, 2008).

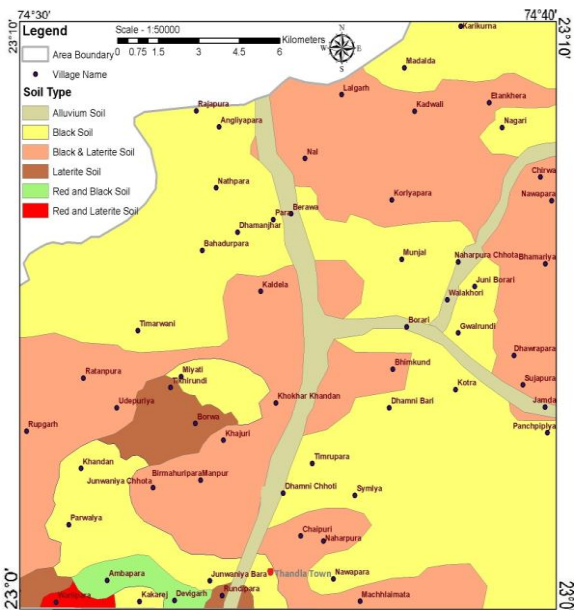


Figure 11: A Photograph exhibiting relationship of different types of soils in Thandla study area, Jhabua district.

Conclusion

The qualitative geomorphological analysis of Thandla area provides important features in respect of various landforms such as Hilly terrain, undulating country, and plain country. The characteristic features of landforms have been described and illustrated in the text of paper which provides a panoramic view of Thandla landscape picture.

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